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## An Estimate of the Need for Environmental Health Academicians in the Workforce

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This report is an abbreviated version of a position paper in the final report, "Evaluating the Environmental Health Workforce," of a workshop held in July 1987. The workshop was sponsored by the Bureau of Health Professions, Health Resources and Services Administration, Public Health Service. The final report was published in January 1988.

### Synopsis .....

*In July 1987, a workshop was held to evaluate the environmental health workforce. The workshop was sponsored by the Bureau of Health Professions, Health Resources and Services Administration of the Public Health Service. Participants were drawn from State and local agencies, Federal agencies, industry, and academia. Estimates of workforce needs were based on background information and informed consensus judgments of workshop participants. The final report of the workshop was published in January 1988.*

*The authors synthesize some of the consensus judgments and review data from a position paper developed for the workshop. The supply, demand, and projected need for new academicians in environmental health on both graduate and undergraduate levels through 1992 are estimated. These estimates are based on the need*

for persons trained in the various environmental health subspecialties identified during the workshop. Outlined are the number and educational backgrounds of new

faculty required. The types of new training programs that are required to meet the needs for environmental health specialists through 1992 are discussed.

**I**N THE SUMMER OF 1987, a workshop was convened to evaluate the environmental health workforce and to make estimates of supply and demand for the various specialists in environmental health (1). The position papers formulated for the various specialty areas at the workshop and additional data acquired after the workshop were used to estimate the supply and demand and to project the need for additional academicians in environmental health. Projections were made for faculty in graduate and undergraduate programs, inside and outside schools of public health, through 1992. These data were presented in a paper on academicians that was included in the final workshop report (2). This article is a synopsis of the paper.

In this paper, we define a faculty member in environmental health as a person qualified by education and practice to teach the principles and concepts of environmental health at the graduate or undergraduate level; conduct research on the relationships of physical, chemical, and biological processes that impact the environment and subsequently human health; and serve as a community resource for addressing environmental issues.

Faculty members in environmental health may be educated either in environmental health or in a field that contributes to the interdisciplinary nature of environmental health, such as the physical, biological, and chemical sciences; health sciences; engineering; social and behavioral sciences; administration; policy; or planning. Approximately 70 percent of graduate faculty members and 85 percent of undergraduate faculty members in environmental health were educated in a discipline other than environmental health (3).

The majority of environmental health faculty members hold a doctoral degree. Those without doctorates are gradually being replaced by people holding doctorates (3).

### Supply-Demand-Need Estimates

A summary of the supply-demand-need estimates for environmental health professors shows

Year	Supply	Demand	Need
1987	2,065	2,065	2,275
1992	<sup>1</sup> 2,170	<sup>1</sup> 2,170	<sup>2</sup> 2,629

<sup>1</sup>Based on a 5-percent increase from 1987 to 1992.

<sup>2</sup>Based on a conservative estimate of only 25 percent of the total need for new specialists being met by 1992. (See table 1)

The definition of supply-demand-need concepts as used in the workshop are

- supply—the number of qualified personnel available to practice a given occupation, including those employed (or self-employed) and those seeking employment in the occupation;
- demand—the number of funded positions in a given occupation, whether filled or unfilled;
- need—the number of persons in a given occupation judged as required to produce a desirable level of service.

### Supply

The supply of environmental health faculty was estimated using data from background papers, workgroup position papers (2), and data from professional associations, personal information, and experienced judgment. As seen in the table on page 000, a total of 2,065 environmental health faculty members was estimated for 1987. By 1992, this number is expected to grow to 2,170, a modest 5-6 percent increase.

### Demand

Currently, the demand for environmental health professors equals supply, as evidenced by the relatively few faculty positions advertised in the Chronicle of Higher Education and professional environmental health journals (2). While there are a few unfilled positions, the qualified applicant pool for these positions is also limited. Scientists and engineers who are potential faculty are being drawn increasingly to industry over academia, with higher salaries undoubtedly the major attraction.

Future demand for environmental health professors will be influenced by progress in the environmental arena. Legislation, regulation, and interest in environmental issues drives the demand for qualified specialists which, in turn, increases the demand for environmental health faculty.

### Need for Specialists

Table 1 summarizes the additional environmental health specialists needed to meet 1992 requirements. A review of these needs, as discussed in the workshop

Table 1. 1987 supply of and 1992 need for environmental health specialists

Title	1987 Supply	Needed for 1992		
		Percent increase	Additional number	Total number
<b>Hazardous materials</b>				
managers.....	10,000	650	65,000	75,000
Wastewater.....	44,444	27	12,000	56,444
Water supply.....	41,905	21	8,800	50,705
Milk and food.....	10,000	75	7,500	17,500
Industrial hygiene.....	10,938	64	7,000	17,938
Radiological health.....	8,000	75	6,000	14,000
Vector control.....	20,000	25	5,000	25,000
Injury control.....	18,400	25	4,600	23,000
<b>Occupational health</b>				
nursing.....	28,571	14	4,000	32,571
Environmental toxicology.....	3,012	83	2,500	5,512
Occupational medicine.....	2,985	67	2,000	4,985
Solid waste.....	2,000	100	2,000	4,000
Housing.....	2,000	100	2,000	4,000
Land use planning.....	3,947	38	1,500	5,447
Air quality.....	16,667	6	1,000	17,667
<b>Environmental</b>				
epidemiology.....	500	90	450	950
Occupational safety.....	31,000	0	0	32,000

Table 2. Additional environmental health faculty required to meet the need for new specialists through 1992

Program area	Percent of need met		
	10	25	50
Hazardous materials management ..	65	162.5	325
Wastewater.....	12	30	60
Institutional environment.....	10	25	50
Water supply.....	9	22.5	54
Milk and food.....	7.5	19	38
Industrial hygiene.....	7	17.5	53
Radiological health.....	6	15	30
Vector control.....	5	12.5	25
Injury control.....	4.5	11	22
Occupational health nursing.....	4	10	20
Environmental toxicology.....	2.5	6	12
Occupational medicine.....	2	5	10
Solid waste.....	2	5	10
Housing.....	2	5	10
Land use planning.....	1.5	4	8
Air quality.....	1	2.5	5
Environmental epidemiology.....	0.5	1	2
Occupational safety.....	...	...	...
<b>Total additional faculty<sup>1</sup>.....</b>	<b>142</b>	<b>354</b>	<b>709</b>

<sup>1</sup> Assuming a 20-1 student-faculty ratio, with each professor instructing 100 new students between 1987 and 1992. Values are rounded to the next whole number.

position papers, will help place the need for environmental health professors in perspective.

**Minimal need (less than 20 percent increase in supply).** Three groups—occupational health nursing, air quality, and occupational safety—fall into the minimal need category based on the percent increase in the 1987

supply required to meet 1992 needs. While the percentages in these categories may be small, they represent a substantial number of persons, since these are large specialty areas.

Occupational health nursing requires 4,000 additional persons to meet 1992 needs. Additionally, many positions in occupational health nursing and occupational medicine are staffed with professionals from other disciplines in order to fill critical needs. According to the workgroups, there is a need to train these nurses and physicians in occupational health and augment their numbers with additional professionals educated and credentialed specifically in occupational health nursing and occupational medicine.

Approximately 18,000 of the current supply of 29,000 occupational health nurses need more training.

Occupational safety includes 31,000 specialists. Little growth is projected for this category, and there may even be a small surplus of these professionals in 1992.

**Moderate need (20-60 percent increase in supply).**

Water, wastewater, vector control, injury control, and institutional environmental health are among the most traditional environmental programs and have the most stable supply of specialists. The projected increased need in these fields is moderate. These programs typify the range of educational experiences required in all practice areas. Based on the opinion of the workgroups, persons in these practice areas need

- basic short courses and technician training
- basic undergraduate education in the sciences, public health, and communications
- post graduate education for researchers in air and water quality maintenance
- additional knowledge of chemistry, biology, toxicology, and environmental epidemiology for vector control personnel.

While educational programs in injury control are considered important, there are few comprehensive programs addressing this need in the country. In addition, the possibility of modifying the skills of surplus occupational safety personnel to meet the nonoccupational needs of injury control is not being considered.

**Substantial need (61-99 percent increase in supply).**

Substantial needs for professionals in several categories are projected through 1992. These include the more traditional fields of radiological health, milk and food, solid waste, housing, industrial hygiene, and the newer fields of environmental epidemiology, environmental toxicology, and occupational medicine. Existing programs need to be enhanced and new programs developed to address these pressing environmental

health concerns. Based on the opinion of the workgroups, there is a need for

- specialized undergraduate courses in bacteriology and food protection
- formal educational programs, graduate education, and training courses in radiological health
- additional training in toxicology, environmental epidemiology, and industrial hygiene-like skills for persons working in the area of housing
- new training programs in applied toxicology
- additional course work in engineering, toxicology, epidemiology, and biology for solid waste managers
- continuing education courses for solid waste managers.

**Acute need (100 percent and over increase in supply).** It is interesting that acute needs through 1992 are projected in some of the most basic and traditional fields of environmental health. Requirements of 100 percent increase for housing and solid waste workers are estimated.

Regardless of the criteria used, the need for hazardous materials managers ranks number one. This reflects the need for growth and development of this specialty area as well as the demand for significant numbers of new personnel in the field. Based on workgroup position papers, there is a need for

- hazardous waste training programs for hazardous waste managers, environmental epidemiologists, environmental toxicologists and risk assessors
- new training programs in risk assessment
- a "pyramid approach" to environmental education which educates generalists at the undergraduate level and specialists at the graduate level.

## Need For Faculty

Additional faculty will be required in response to increasing need for specialists. Table 2 projects the number of new faculty required based upon the percent of new specialist positions that are needed. A 20-to-1 student-to-faculty ratio is assumed, with each professor able to instruct 100 new students over the next 5 years.

Table 2 ranks the numbers of new specialists needed by 1992 and indicates a need for 65 new faculty in hazardous materials management programs if only 10 percent of the anticipated need is met.

This number was derived as follows: There is a projected need for 65,000 new hazardous materials specialists over the next 5 years (table 2). If 10 percent of that requirement is met, 6,500 new positions will be filled. If each faculty member can instruct 100 students, 65 new faculty members are required. If 25 percent of the

*'Retired people seeking second careers are another valuable source of new professors. Scientists and engineers, previously employed by government and industry, should be encouraged to continue using their talents in the academic setting.'*

demand for hazardous materials specialists is satisfied, the requirement for new faculty rises proportionately.

If one assumes that only 25 percent of the total need for all specialists is met by 1992, there will be a projected need for 354 new professors of environmental health in all academic institutions (undergraduate, graduate, and in schools of public health). This is the estimate shown in the table on page 000.

Recognizing the interdisciplinary nature of environmental health, table 3 delineates the general educational backgrounds of faculty appropriate for the program areas in greatest need. Faculty responsible for bachelor and master degree programs may have a broad spectrum of educational backgrounds while faculty responsible for doctoral students would have educational backgrounds and experience more specifically tailored to the individual doctoral discipline.

While there is a genuine need for new faculty in environmental health, it is not realistic to assume that these needs will be met to a significant degree in the near future, for several reasons: (a) the priority placed on higher education by the public sector, (b) the length of time required to produce a new doctoral graduate, (c) the competition for doctoral graduates by the private sector, and (d) the additional experience required of new doctoral graduates to become effective teachers.

## Factors Impacting Need

Several overriding issues could also impact the need for additional environmental health faculty in the future. The competing pressures of environmental concerns and economic growth, and the ways in which these opposing forces translate into governmental policy, will affect the demand for environmental specialists and subsequently faculty. Legislative direction on behalf of the environment will shape the emerging fields in environmental health. The commitment to environmental legislation and the time and funding required to implement new laws greatly influences the need for new environmental personnel. These issues underscore the dependence of environmental health on

Table 3. Educational backgrounds of environmental health faculty appropriate to program areas of greatest need

Program area	Faculty educational background
Hazardous materials management	Environmental health, engineering, chemistry, biology, toxicology, mathematics modeling, epidemiology, management-planning
Water-wastewater	Environmental health, engineering, chemistry, microbiology, biology
Institutional	Environmental health, institutional health, infectious diseases, safety, epidemiology, health care management
Milk and food	Environmental health, microbiology, epidemiology, chemistry, toxicology
Injury control	Health education, environmental health, industrial hygiene, accident prevention, epidemiology
Vector control	Environmental health, entomology, biology, chemistry, toxicology, veterinary medicine, management

the public sector and emphasize the necessity of governmental commitment to environmental issues.

### Addressing Shortages

**New teaching programs.** A number of suggestions for the direction and formatting of new curriculums in environmental health have been outlined. Since environmental health is dependent on government policy and legislative initiative, government must take the initiative in funding support.

In the 1970s, the Federal Government's Bureau of Health Professions had funds to support new faculty and new teaching programs in environmental health.

These support programs, which have been discontinued, were significant vehicles to foster development of academic programs. It is imperative that they be reinstated so that pressing curriculum needs may be addressed.

**New professors.** New professors of environmental health will be drawn primarily from doctoral graduates of programs in environmental and related fields. Advanced graduate students can be supported with fellowships, research stipends, cooperative programs with government and industry for field placement, and non-traditional programs for part time students.

Retired people seeking second careers are another valuable source of new professors. Scientists and engineers, previously employed by government and industry, should be encouraged to continue using their talents in the academic setting. Partnership programs between universities and government could be devised to compensate all professors at levels that would be attractive enough to stimulate entry into the academic field. In addition, full social security benefits should remain for anyone electing to teach, at any academic level, in their retirement years.

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